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SMES-NET IS A PROJECT THAT HAS RECEIVED RESEARCH FUNDING FROM THE COMMUNITY'S SIXTH FRAMEWORK PROGRAMME

SMES-NET

VISION PAPER

Ten Theses on Food and Drink SMEs and Innovation in Europe

EVIDENCE ON NEEDS AND POLICY RECOMMENDATIONS

CONTENTS

INTRODUCTION

This **Vision paper** aims to incorporate into an overall picture the factors that can positively drive the European Food and Drink industry (F&D), by describing those measures and strategies that can stimulate Small and Medium-sized Enterprises (SMEs) to employ innovation more widely.

If successfully implemented, the medium- and long-term impact of all these orientations will be to shape and promote the competitiveness of the European food sector. The importance of this sector to Europe is much greater than its significant economic value, it is an essential element of cultural identity. The success with which the European food sector will conciliate tradition with modernity will be a major factor in determining its overall success.

The present document represents the final stage of the study and consensus project SMES-NET[1].

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[1] This Vision paper is intended as a stand alone document: however, further context might be given by reference to three major outputs of the project:

- the Discussion Paper of July 18. 2005, tracing the state of art and the expected evolution of the sector. This discussion paper was commissioned as a starting document for defining a common vision among major stakeholders at a European level;
- the European survey about the needs, expectations and evaluations of the various sectors operating under the umbrella of the Food and Drink industry in 11 European countries. Covering more than 1200 correspondents, the survey (probably the most complete yet performed) was a very significant effort towards understanding the curent practices and future perspectives of innovation in this industry.

Turn-over:	90 bln Euro
Employees:	744 000
R&D expenditure:	892 mln Euro
N. of R&D departments:	605
N. patents:	2586

The results obtained provide an informative basis for a wide-angle evaluation of the dynamics of the food and beverages industry as a whole. General and national survey results are available as annex to the Vision Paper;

The European Food Sector

The Food and Drink sector (F&D) is one of the backbones of the European economy and will become even more important as enlargement progresses. This sector has a turnover of 815 billion Euro (14% of the manufacturing sector's total) and, with a workforce of 4 million, it is the leading employer in the manufacturing sector[2].

As one of the most impressive logistical arrays connecting the end consumers with primary production, the European food chain is intrinsically linked with the global dynamic of providing raw materials for food mass production.

The F&D resources for the production, concept development, design and manufacture of foods make it the major global force. The fast changing environment of retailing and logistics is very often not under the control of the industry itself, although it profoundly affects its competitiveness.

The consumer

The rapidly changing preferences of consumers favour an alert, flexible and competitive food sector. Important recent trends such as the expressed desire for healthy and safe food sit side-by-side with classical motivations for choice based on pleasure, culture, basic nutrition and "tradition". The European consumer is thus highly conscious of the great traditions of

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- the Regional Clusters, i.e. those activities that took place in the 12 states involved in parallel with the carrying out the survey. The Clusters were occasions of direct support from national food federations to the work of the researchers. They also constituted an opportunity for involving various stakeholders into the selection and analysis of information about innovation procedures. This in particular helped people from different countries to familiarise with original approaches adopted in the various national environmens to see how the institutional bodies (public and private) cope with the challenge of sustaining the technological effort of their production sector. Regional clusters have also been major occasions for presenting partial results of the survey to the regional stakeholders, especially those related to the countries participating in the cluster.

The Vision paper represents therefore a synthesis, oriented to provide stakeholders with evaluations of the problem at stake and to propose to the European Commission a balanced set of opinions that may help devise suitable policies for the firms operating in the sector.

[2] See "Data and trends of the EU food and drink industry 2005" by CIAA for these and related data.

regional and national *cuisines* and products but at the same time asking new questions concerning food safety, long term health effects, sustainable production, social responsibility, animal welfare etc. Such concerns are choice-influencing motives for an increasing segment of consumers. Tradition can be used to add value to food products, but it is not an added value *per se*. Experience shows that the consumer's attitude to foods and beverages is far from static and that the "unquestionable" attributes of a given food item, can change over time. Food manufacturers need to hear consumer's concerns and desires in the most precise and accurate manner possible.

Who is innovating and why

Competitiveness requires access to cutting-edge science and the employment of the very best available technologies. Modern quality standards are a baseline, a licence to be in the marketplace, they do not bring competitiveness in themselves. Companies must be able to identify needs and desires and to conceive products and manufacturing processes before their competitors. Food producers are often convinced of the intrinsic quality of their products; many believe that food must remain the same and that only small incremental modifications are required. This attitude risks confining many producers to a circle of conservatism. There is a clear distinction between the aggressive modern companies and the traditional producers whose concept of food making is based on continuity with the past; it is no surprise that the former group are taking the lead.

R&D, innovation, and SMEs

It is clear that the F&D is sustained largely by SMEs and this partly explains the relative slowness with which innovation is pursued. However, the size of SMEs can also represent an advantage, in that radical re-directioning is more possible. The overall objective of the SMES-NET project is to identify a strategy for significantly improving the innovation behaviour of food SMEs. The generation and gathering of such high quality information obtained has permitted a strategy to be proposed for fostering the innovation capacity of the F&D SMEs.
The first stage of this process can be achieved through a radical re-evaluation of the role that science and technology can play in the pursuit of competitiveness of the F&D industry.

1. TEN KEY THESES

As a **Vision Paper**, this document aims to trace a broad view of how European SMEs in the food sector can best use R&D and innovation.

This is done by putting forward statements and commitments concerning the possible forms of future involvement of the Small and Medium-sized European firms of the Food and Drink industry in competitiveness-enhancing R&D.

In particular, the text justifies, develops and explains ten key theses:

THESIS 1: INNOVATION BEHAVIOUR IS CORRELATED WITH "INPUT FACTORS": CAPACITY, AVAILABILITY, AND PERFORMANCE OF R&D FACILITIES OF THE COMPANY AND QUALITY AND LEVEL OF THE HUMAN RESOURCES, WHICH ARE MOST OFTEN RELATED TO THE SIZE OF THE FIRM.

THESIS 2: THE INNOVATION BEHAVIOUR OF THE FOOD AND DRINK COMPANIES GOES WELL BEYOND ORDINARY R&D ACTIVITIES.

THESIS 3: THE PERCENTAGE OF PARTICULARLY SKILLED ELEMENTS IN THE WORKFORCE IS A MAJOR DETERMINANT OF INNOVATIVE COMPANIES.

THESIS 4: COMPANIES ARE ON-GOING INNOVATORS THROUGH TIME, ESPECIALLY THROUGH "PRODUCT" INNOVATION ACTIVITIES, EVEN MORE THAN "PROCESS" INNOVATION ACTIVITIES.

THESIS 5: COMPANIES CONSIDER THAT "PRODUCT DESIGN" IS THE MOST IMPORTANT CATEGORY REQUIRING DEVELOPMENT FOLLOWED BY "MANUFACTURING PROCESSES" AND "PACKAGING".

THESIS 6: ALL PILLARS OF ETP "FOOD FOR LIFE" ARE CONSIDERED IMPORTANT BY THE MAJORITY OF FIRMS. HOWEVER, ISSUES ABOUT "QUALITY AND MANUFACTURING", "FOOD SAFETY", AND "FOOD AND THE CONSUMER" ARE SEEN BY FAR THE MOST IMPORTANT ONES; "FOOD AND HEALTH", "SUSTAINABLE FOOD PRODUCTION" AND "FOOD CHAIN MANAGEMENT" ARE SEEN AS SLIGHTLY LESS IMPORTANT.

THESIS 7: "BEST PRACTICES GUIDES", "TRAINING" AND FREQUENT "SEMINARS & CONFERENCES" ACTIVITIES ARE THE MOST SOUGHT SUPPORT ACTIONS FOR TECHNOLOGY TRANSFER. FINANCIAL SHORTAGE IS THE MAIN FACTOR THAT INHIBITS INTERNAL R&D IN SMES. BUREAUCRATIC BARRIERS ARE JUDGED STILL TO BE TOO HIGH.

THESIS 8: USEFUL INFORMATION FOR INNOVATION MAINLY DERIVES FROM MARKET RELATIONS (CLIENTS, SUPPLIERS, EQUIPMENT PROVIDERS). TECHNOLOGY TRANSFER BODIES, TRADE ASSOCIATIONS AND TECHNICAL LITERATURE FOLLOW SUIT. FOR A MAJORITY OF FIRMS, INNOVATION HINGES UPON INTERNAL R&D.

THESIS 9: FOOD AND DRINK COMPANIES HAVE A SOBER AND REALISTIC ATTITUDE TOWARDS INITIATIVES OF SUPPORT FOR THE FOOD INDUSTRY. OPINIONS ABOUT FUTURE FINANCING EMPHASIZE THE PREFERENCE FOR THE EU AS A KEY FUNDING PARTNER. PREFERRED POLICY MEASURES ARE THOSE THAT EXPLOIT MORE OPPORTUNITIES FOR SELECTIVE SPENDING. BIG FIRMS ARE IN FAVOUR OF FISCAL INCENTIVES, SMES LOOK FOR MORE DIRECT SUPPORT.

THESIS 10: A PROMISING POLICY OF ENHANCING AND SUPPORTING INNOVATION IN THE FOOD AND DRINK SECTOR SHOULD BE BASED ON A MIX OF ACTIONS INSPIRED BY THE PRINCIPLES OF "SOFT" AND "TARGETED" POLICY MAKING. THIS INCLUDES: SOPHISTICATED TECHNOLOGY TRANSFER, COMPETENCE CENTERS AND NETWORKING PROGRAMMES.

2. THE PARADIGM OF TECHNOLOGICAL CHANGE IN THE SECTOR

In short, technological change is a process by which a given product and its production process are transformed by introducing a defining new element. This generates a significant modification that, if coherent with technical and economical desirability, brings a clear competitive advantage for the manufacturer[3].

According to the principle that is at work, the innovation and technical improvement can either depend mainly on science, i.e. breakthrough scientific results, or on the selective and opportunistic exploitation of an existing technology. The first case described is characteristic to a **radical innovation** whilst the second case is more properly described as an **incremental innovation**.

The **diffusion** process is critical to both scenarios, i.e. the way in which innovation reaches companies and is positively adopted by them.

As introduced by the SMES-NET Discussion Paper, "a **system-approach to innovation would have a tremendous** potential in the food industry. A co-ordinated innovation embracing the whole food chain with convincing risk-benefit assessments and wide involvement of industrial and scientific communities, could deliver a full range of improved and new products."

If, in other words, national and international authorities and policy makers are aware of the needs and expectations that emerge at different levels of the food chain as a priority for companies, it would be possible to shape certain preferred measures to foster (or to facilitate) the propensity of single firms to innovation".

For this reason it is essential to combine the information gained from the SMES-NET survey with that which is gathered from knowledge of the **dynamics of innovation patterns**.

[3] The advantage can be technical (feasibility of a new process) or economical (more efficiency with cost reductions) or very frequently a mixture of the two.

An **innovation pattern** is a typical sequence of assumptions, decisions and actions governing the evolution of technical change in a company. It is triggered by various possible actions, but normally it has two major causes: 1) A company innovation programme stimulated by internal R&D or by an available technology which is rapidly changing the standard manufacturing process of the company; 2) Search for improvements, capable of modifying certain desired features of the product or of its manufacturing process.[4]

There are many ways in which these factors can be assembled and can function as a "booster" or as a cause of delay for research and implementation programmes.

This explains why the innovation process is intrinsically unstable and uncertain in its results. In order to reach a reasonable and manageable level of industrial risk, it is therefore necessary to orient the innovation pattern of a single company, or group of companies, or even for the full sector, united behind some common target or objectives.

Innovation patterns differ depending on, amongst others:

- the type of innovation pursued;
- the resources (technical and financial) available to the innovator;
- the nature of the innovation, including the maturity and exploitability of the area of research;
- the kind of expected results.

It is important to underline the fact that an innovation pattern is not something abstract; rather it is something that is clearly visible in the day-to-day behaviour of a company and its workforce.

If, as appears to be the case, innovation is linked to behaviour, it is also possible to adjust conditions and direct actions to stimulate certain behaviour patterns and make them more productive and efficient.

Hence the purpose here is to investigate more carefully how innovation patterns at company level reflect certain assumptions and conditions regarding the innovation environment and potential of the firm.

[4] These features are normally sought after because of their economic desirability.

2.1. Context 1: Structure of industrial innovation

The individual companies consulted in this survey can be *a priori* affiliated to profile groups, i.e. clusters reflecting certain structural features of the companies. In fact the overall sample presents features that are by their own nature, bearers of important segmentation towards the whole of the industry under scrutiny. Factors like **size** (either expressed in function of **turnover** or **number of employees**), **specific R&D facilities** measured in terms of the traditional support system to scientific research and **size and quality of human resources** are all values that by definition define a typical attitude to the theme under discussion. "This means that the sample show a certain degree of *a priori* **affiliation** to a model of innovation pattern which is expressive of the average behaviour of companies sharing those features".

THESIS 1: INNOVATION IS CORRELATED WITH INCREASING AMOUNT OF "INPUT FACTORS": CAPACITY, AVAILABILITY, AND ARTICULATION OF R&D FACILITIES OF THE COMPANY, QUALITY AND LEVEL OF THE EMPLOYED HUMAN RESOURCES, WHICH IN TURN ARE SIGNIFICANTLY AFFECTED BY THE SIZE OF THE FIRM .

Structural aspects tend to emphasise the obvious correlation between the innovative attitude of a firm and its size and degree of complexity; it is easy to prove that, in general, the bigger the company, the more intensive is its investment in innovation.

This is true but must be fine tuned, in the light of more elaborated notions of innovation.

1. Food companies in Europe are mostly micro (78.9%) and small (16.6%); medium size company account for 3.6% and so the remaining 0.9% is made up of large companies[5];

2. There is evidence that big companies are big investors in R&D and show a high proportion of qualified personnel in house. Big investors also normally have a wide range of research interests: they spend

[5] Source: CIAA, 2005. *Op. cit.* The structure of the sample of the survey confirms this, with a more than proportional presence of small and medium-size enterprises.

money on several different research programmes in various research areas (from product design to packaging, from IT to biotechnology etc.);

3. Medium-sized enterprises are, in a sense, the most significant representatives of the innovative behaviour: they have a much higher degree of adoption of new technologies than the average, show an important level of formal R&D activity, and are very attentive to the quality of their own workforce. These companies are frequently involved in specialised research programmes in really innovative sectors. They are likely to be among the industry component more sensitive to growth directly linked to innovation activities;

4. SMEs would be, according to this *a priori* distribution, always lagging behind. They inevitably present lower standards of facilities and propensities directly associated to R&D formal engagements. But **this assumption has been proved not to be true**. Self-declared introduction of major innovations characterises large percentage of SMEs[6]. There is a high proportion of SMEs whose attitude to the market is clear-cut and aggressive. They have an expansive profile and look continually for occasions of development. They do not have internal R&D departments with many employees with a university degree and very rarely possess patents. But they are nonetheless genuine innovators and have something to say about what real innovation is.

These observations prove that contrary to a much-repeated opinion, the Food and Drink industry is not limited by nature to small innovations. The *parterre* of companies which constitute the "core" of the food and drink production systems, are small manufacturers whose profile as innovators tend to be underestimated by current measures of innovation. But they are informal innovators, with a high motivation to invest in their own business and a strong reactivity to the new conditions of their relative markets.

[6] Whereas the percentage becomes larger than 50% if minor improvements are included. See later on in this document and in the Annex for specific data.

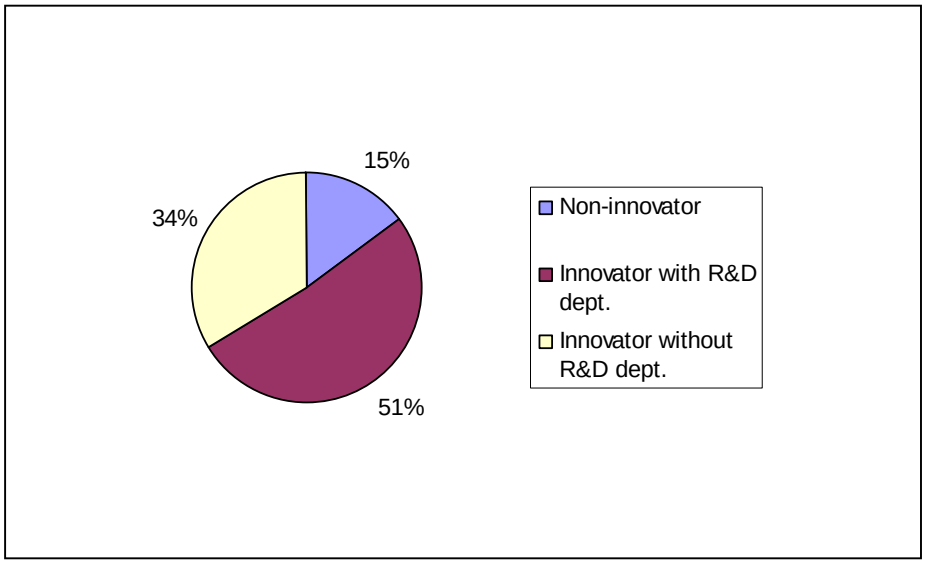
THESIS 2: THE INNOVATIVE BEHAVIOUR OF THE FOOD AND DRINK COMPANIES GOES WELL BEYOND THE ORDINARY R&D ACTIVITIES.

In the light of the previously developed reasoning, it is clear that it would be misleading to consider the average innovation capacity of the sector as equivalent to the low figures that can be recorded by traditional official statistics and propensities to technological investment.

If we would limit ourselves to monitoring of formal innovations, only a small fraction of the large and medium size enterprises would be classified as adequately involved in innovation activities. In reality things are slightly different.

1. There is not any direct evidence that all innovations come out from R&D departments with "high numbers" both in terms of size and personnel employed.

Innovation profile of the companies



Note: weighted data. Innovator defined as a "firm that introduced in the last 3 years at least some improvements in product or process".

It is demonstrable that many SMEs (and even medium enterprises) with relatively low level of formalised research structures are nonetheless in the group of genuine innovators. This can be seen from the relative low proportion of existing and **active internal**

R&D departments at firm level compared to other indicators like for instance their vision towards their own markets;

2. Similarly another frequently used proxy of propensity to innovation like the number of **Patents** adopted by each single company, is not particularly appropriate to describe the normal behaviour of food and drink companies. Patents are possessed by a small number of companies, normally by the large ones but not so infrequently by also medium and small ones.

Patents in the industry by firm size (column percentage)

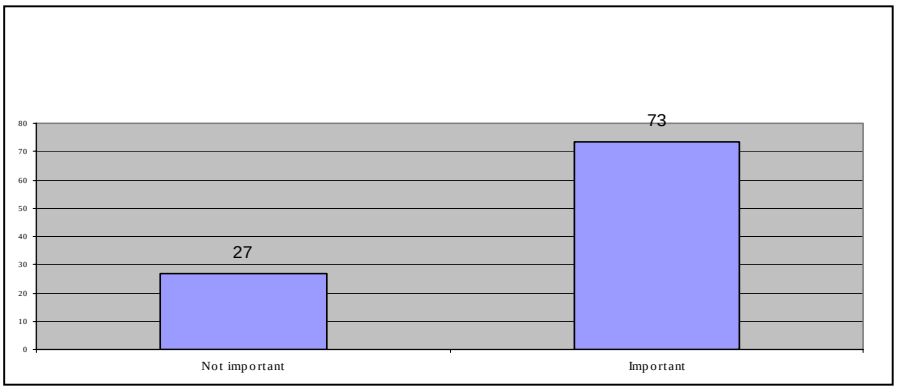
	Overall	0-9 employees	10-19 employees	20-49 employees	50-249 employees	250-499 employees	500-999 employees	1000-9999 employees
No patents	61	92	68	60	69	52	36	21
Yes, 1 patent	11	1	15	16	10	21	1	15
Yes, 2-4 patents	12	7	5	13	8	13	30	25
Yes, 5-9 patents	4	0	9	2	2	2	3	20
Yes, 10-50 patents	2		0	3	1	1	5	6
Yes, more than 50 patents	2				0	4	1	8
I do not know	8		4	6	11	8	24	4
Total	100	100	100	100	100	100	100	100

Distribution of patent availability shows that the patent ownership is either the sign of a multi-product company with several innovative lines in many different directions (oligopolistic companies, often multinational) or is the indicator of a genuinely innovative firm, which has achieved a significant result in process development in generation of product idea and has deserved a single patent. Both cases are minority cases. The vast majority of innovators in the food sector get substantial advantages through other channels of innovation promotion[7].

3. Companies, even those with clear and distinct ideas about the value of innovation for growth, might prefer **imitation** as a profitable strategy to cope with market developments and evolutions.

[7] This amounts to a general profile of innovation which privileges an attitude of company decision-makers based upon the relative advantage of existing innovations rather than from the dramatic change of new and untested solutions.

Importance of informal activities for innovation



It seems therefore that the whole rhetoric of "more innovation = more business success" is limited to the opportunistic attitude of the front line of companies whose innovative behaviour is tempered by a realistic approach to the costs of and high demand of formalised technical innovation.

THESIS 3: THE PERCENTAGE OF PARTICULARLY SKILLED WORKFORCE IS A MAJOR DETERMINANT OF INNOVATIVE COMPANIES.

A high percentage of skilled workers is a sign of a positive attitude towards innovation, regardless of any other factor of the company. The presence of skilled workers in micro and small companies can represent an important element of innovation in a context where absolute numbers are low. By contrast, larger companies with their greater number of employees do not necessarily show a relatively large share of university personnel. They gain their competitive advantage from a number of factors that obscure the direct contribution of people skilled for creating innovation.

Crucial is the kind of "collaborative mix" that the working units, especially skilled staff, put into practice within their enterprises or within their departments. Details here are important and may add new unexpressed evidence to the topic under examination.

Presence of skilled workforce. Percentages by type of innovation pursued by the firm

How many employees working in your firm have a University degree?	Major product innovations %	Product improvements %	Major process innovations %	Process improvements %
<1%	16	79	13	51
1%-5%	32	77	27	62
6%-10%	39	78	27	55
10%-20%	38	73	32	70
>20%	48	76	31	53
Average	34	74	26	57

1. In general terms it further confirmed that increased firm size (in terms of turnover and/or number of employees) is positively correlated with a strong appreciation of the role of workforce as a major factor of influence with respect of innovation. This reveals, at one end of the explicatory range, that greater enterprises have more skilled workers (expressed for example as percentage of people with a **university degree**). The speed at which this happens is nonetheless higher in the transition from micro-small to medium size enterprises.
2. Medium size enterprises are those that in proportion employ in higher degree personnel with a university diploma; it seems that those firms are more familiar with highly educated workers compared to others.
3. Moreover it seems that the real balance between quality of the workforce and desired results in terms of output for a firm is reached by medium size companies with a **good positioning** in their markets. An educated personnel is more frequent in companies with a high position (**top quality** niche and **high standard large mass** market).

These phenomena show how the importance of the human factor for innovation is essentially a **relative importance**. Although increase in numbers (turnover and size in term of employees) assures a certain degree of involvement of personnel with a promising professional profile, it is very probable that the contribution of skilled workers depend on a number of additional causes which ultimately rely upon the awareness of the

working environment and the programmes that the entrepreneur and her management have in mind for the future[8].

The medium sized enterprise appear to reach a balance of attitude which seems really to put in practice the ideal of the innovative company, because it can have large **percentage** of skilled employees (as the small ones) and also fairly high **absolute numbers** (as the large companies).

2.2. Context 2: The areas of actual innovation

The direct study of the areas of innovation of companies is always an important source of information. It puts the researcher in a position to understand what is happening, at least to some extent, in the decision-making priorities of the industry. It reveals a salutary connection between what firms say want they want to do and what companies *actually* do.

For this reason, it is important to investigate the nexus that connects the innovation pattern of the industry[9] and the innovation paths that each single company determine as pivotal for its own development.

[8] The critical aspect is twofold: on the one hand, properly trained employees (e.g. with University degree) are key to the "absorption capacity"; on the other hand, a motivating environment (inside and around) the workplace engender the specific application of attention and dedication that is needed to reach innovation.

[9] As seen from the perspective of the segmentation of the sample used in the survey.

THESIS 4: COMPANIES ARE ON-GOING INNOVATORS THROUGH TIME, ESPECIALLY THROUGH "PRODUCT" INNOVATION ACTIVITIES, EVEN MORE THAN "PROCESS" INNOVATION ACTIVITIES.

The first important aspect of this area of interest regards the modes of recently introduced innovations[10]. The first and most important phenomenon is about the main orientation of the companies with respect to what they rate most critical for their internal innovation.

1. Quite unsurprisingly, the amount of innovation made by firms tends to increase with firm size. **Larger companies are more prone to invest resources and effort in a multiplicity of innovative activities**;
2. It must be noted that the distribution of this activity presents different levels of intensity, which in turn reflect different priorities, and therefore probably different strategic approaches, to internal R&D;
3. **Product improvements** (i.e. those actions that have to do with rapid amelioration of features of the product directly linked with its defining values: taste, nutritional composition, variation of "range"), is the top activity; it is the core of quality and presentation of the product and hence the area where most money (and effort) is destined. It is interesting to note that this activity is relatively strong in each firm, and is high also in **micro** and **small** enterprises;
4. The category of **process improvements** (i.e. actions that are aimed at improving the efficiency and performance existing technology, frequently by incremental investment on the manufacturing line already in place), comes second in this ranking[11].
5. By contrast the category of genuine **recently introduced major** innovation, i.e. actions targeted to the introduction of technical change with substantial effects on the normal industrial activity of a company, reveals that: first **major products innovations** are more adopted than **major process innovations**. This likely means that the sample "dreams of" a radical improvement of the product,

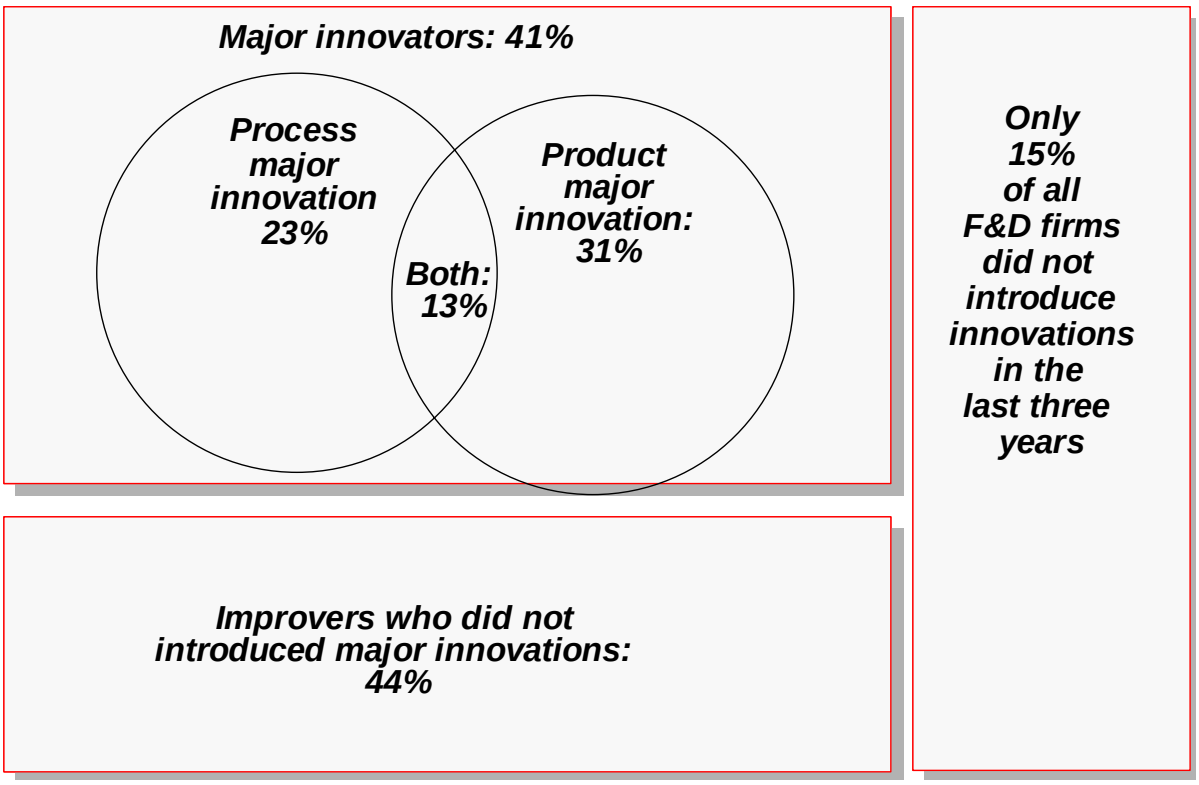
[10] A time framework of 3 years has been chosen, which is a reasonable period for surveying innovation types of companies.

[11] This also augments with size but is very scattered among all types of companies in the sample. It can be considered an on-going effort towards innovation gained through incremental technical change generated by specific attention paid to the efficacy and efficiency of the manufacturing process.

considering that such improvement would result in a potentially "devastating" competitive advantage.

6. Moreover, more differences among groups of firms (expressed by size) emerge from this. **Major product innovations** are an area of critical investment and workforce proficiency: it is in any case more costly. For this reason, it is unevenly distributed among the sample. Micro and small companies show lower proportion of engagement in this direction. Medium size units show a substantial increase in this area of interest, denoting probably a clear-cut orientation to investment towards new and diversified products. Innovation is after all also a search for something "radically different" (with all the risks that this implies in a traditionally oriented sector like the Food and Drink industry).
7. **Major process innovation** is also relevant for many companies. It is also an area where big companies invest more, but the average investment rate tends to be more "flat", and hence fairly evenly distributed among various firm.

The profile of companies with respect to innovation overall results:

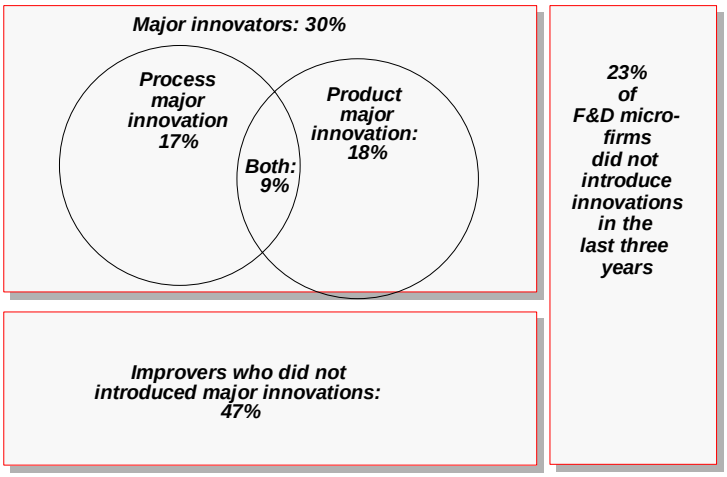


In the light of this evidence, it appears that innovation is a top priority of companies. They clearly perceive the value of this critical activity. But they feel that there are differences in the priority for this action. As an average, **orientation to product** is perceived mainly as the introduction of new products, while the aspect associated to **process innovation** is largely dominated by **incremental innovation** in the form of "active maintenance and surveillance" of existing line technologies. By contrast, it can be noted a polarization between innovators in product vs. process. Major innovations are more frequent with respect to product than to process, the more so the larger the firm.

Size remains a major factor in determining *how much* companies invest into these innovation activities: big companies tend to be proactive in all directions; small companies must choose; medium-sized companies are in a sense the most balanced and emerge as the prototype of innovators in the food industry[12].

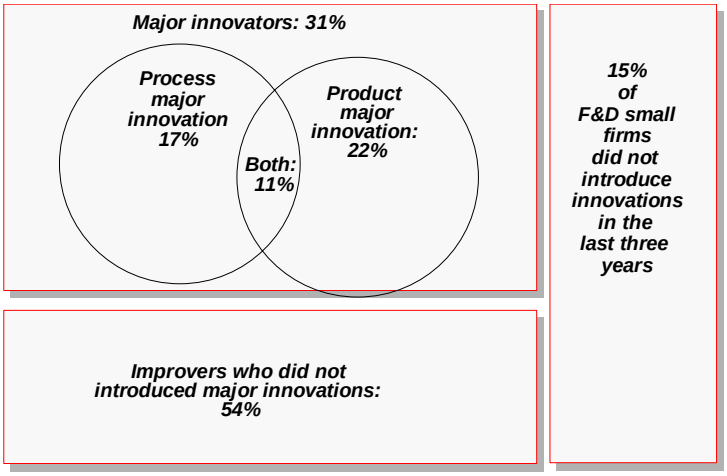
In terms of size, the corresponding distributions are the following:

Micro firms from 0 to 9 employees:

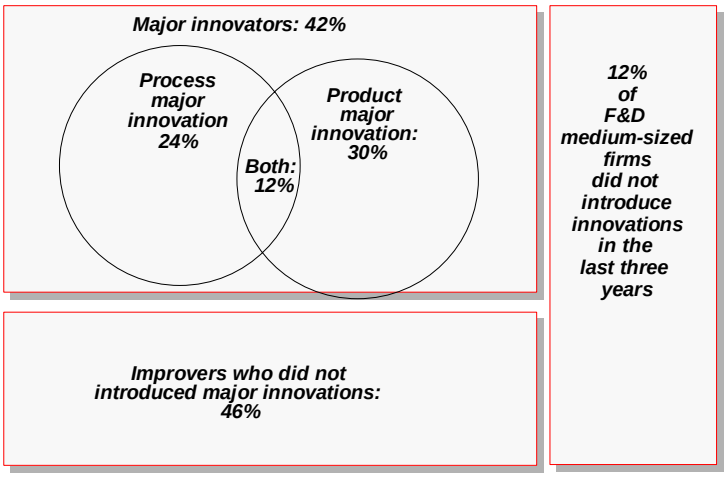


[12] According to the results of the survey, sector differences are no a major source of segmentation on these issues. See for more on that the detailed commentary to the data in the **Statistical Annex**.

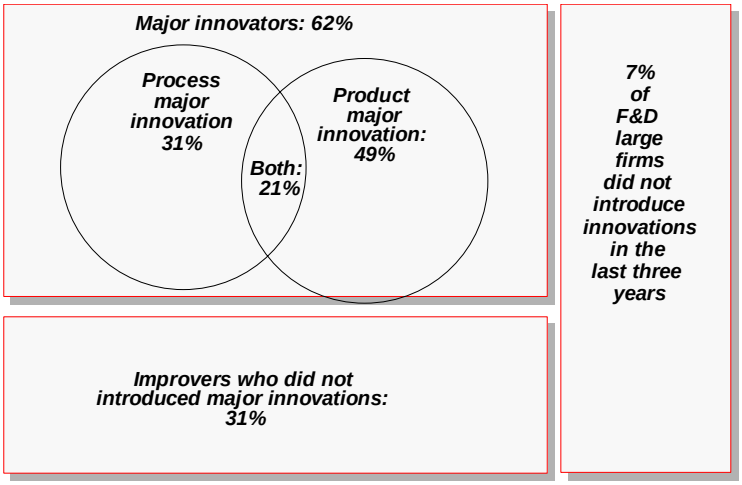
Small firms from 10 to 49 employees:



Medium-sized firms from 50 to 249 employees:



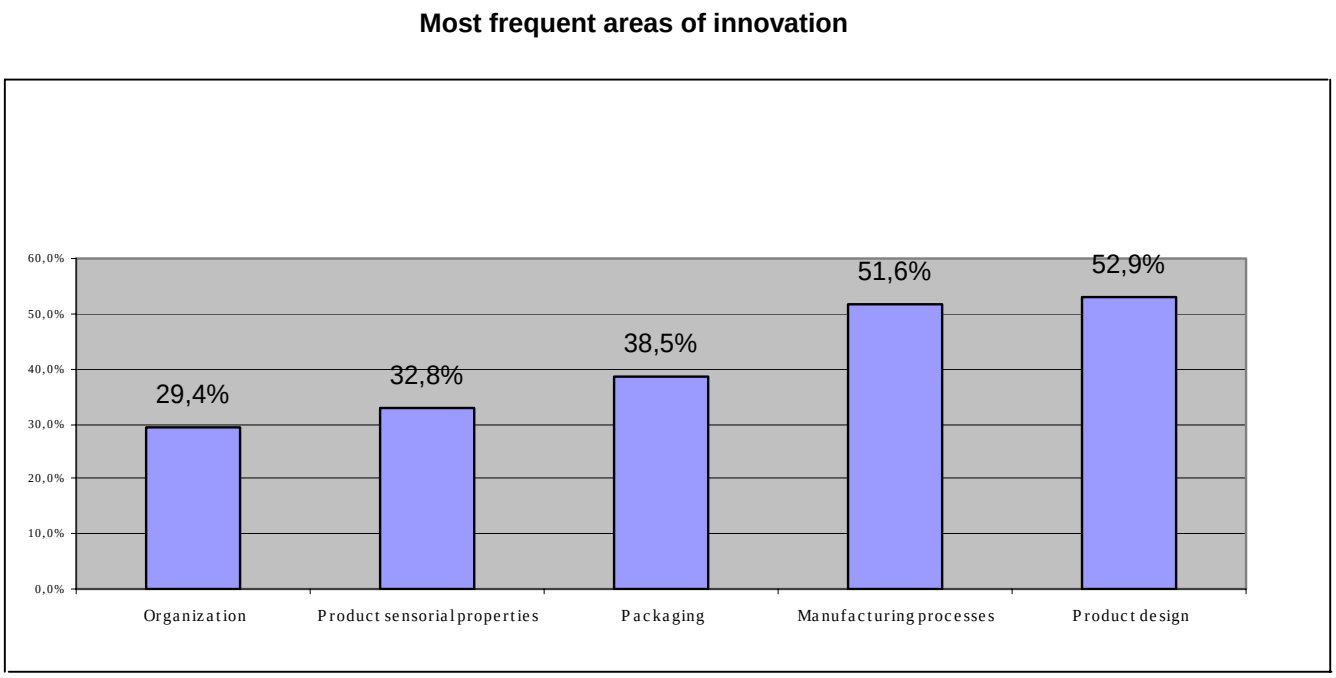
Large firms from 250 employees:



THESIS 5: COMPANIES CONSIDER THAT "PRODUCT DESIGN" IS THE MOST IMPORTANT CATEGORY REQUIRING DEVELOPMENT FOLLOWED BY "MANUFACTURING PROCESSES" AND "PACKAGING".

Closer inspection of the technology families that constitute recently introduced innovation allow a better understanding of choice made by manufacturers. This should allow confirmation of the innovation pattern profile already tested with reference to the thesis 4.

1. The average result for the whole of the industry proves clearly that the ranking for technologies recently adopted is: **Product design** (52,9%), **Manufacturing process** (51,6%), and **Packaging** (38,5%).



2. The first two technology "matrices" are clearly in line with what has already been said. Companies are worried in the short term about efficiency **of their manufacturing line** (which requires likely continuous investment with a relative low intensity), and about **newly introduced characteristics of the product** in the medium term (which in turn requires high investments at a more intermittent time interval).
3. **Packaging,** by contrast, is not considered as a secondary area of innovation by almost every company, probably because of the rapid technical evolution of the available solutions. This is probably an issue

that touches more or less all food specialities and sub areas because of the increasing importance of the commercial driving force of the packaging for the final consumer[13].

4. A further discrimination emerges from the reading of the results at the level of **firm size** (usually expressed in function of the turnover generated by the respondent company). Larger companies are more active in technologies directly associated to **product design**: they are more comfortable on that because of their size in allowing themselves genuine experiments towards new products.

The analysis shows that the **willingness to innovation** tends to be strongly perceived at all level of the food sector and the food chain. The awareness of the fact that a large portion of business success depends on maintaining a comparative level of innovation in the routine of the business is really diffused.

There is some variability in the absolute value of practically accomplished innovation. At the top of this ranking are big companies with established facilities and with a good degree of freedom in choosing new paths for their products. Medium size enterprises come second: they are among the most convinced innovators. Probably because their overall positioning in the food and beverages industry is, in relative terms, the most near to the concept of "**growth through innovation**". They perform well because their business model is centred on the value of technical change and continual research for new products.

SMEs present a sort of twofold situation. On one hand they are relatively sensitive to the issue of defending themselves through a larger recourse to innovation. But they present a global profile that makes the innovative choice difficult.

Their strategies are bound to be either very risky or very opportunistic. In other words small companies may decide to play the role of the really innovative company, looking for an unexpressed technical solution capable of determining a sort of "quantum leap" for the fortunate company; otherwise it may decide to stick to a minimum requisite of innovation, to be

[13] Analysis by sector shows that the branches more interested to packaging are the firms of the **beverages** sector (alcoholic and non alcoholic and the **Fish and Fish products**). See also **Statistical Annex**.

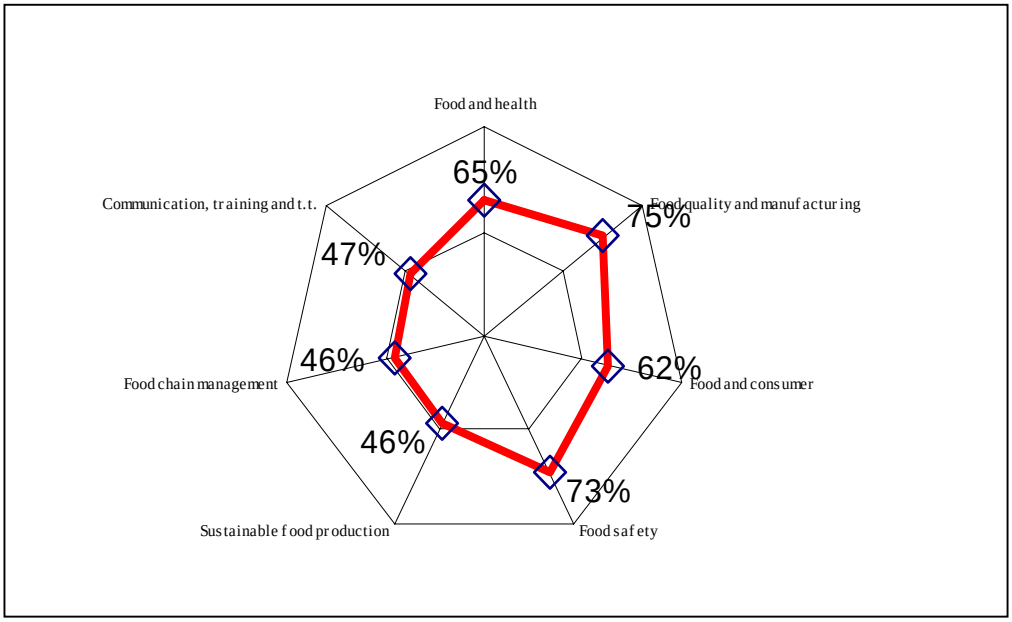
at least less exposed to obsolescence in a fast changing market. It is interesting to remark how this is, quite obviously, the security belt for most companies. And this is represented by an inclination to safeguard at least investments and human resources for innovation associated to the generating process of the company.

THESIS 6: ALL PILLARS OF ETP "FOOD FOR LIFE" ARE CONSIDERED IMPORTANT BY THE MAJORITY OF FIRMS. HOWEVER, ISSUES ABOUT "QUALITY AND MANUFACTURING", "FOOD SAFETY", AND "FOOD AND THE CONSUMER" ARE SEEN BY FAR THE MOST IMPORTANT ONES; "FOOD AND HEALTH", "SUSTAINABLE FOOD PRODUCTION" AND "FOOD CHAIN MANAGEMENT" ARE SEEN AS SLIGHTLY LESS IMPORTANT.

Beyond what they have been innovating in the last three years, firms recognised that exist areas where the companies would like concentrate their effort in term of strategic vision of the sector as a whole.

The most direct way to elicit this information was to survey the companies on the significance of the recently approved scientific pillars of the European Technology Platform "Food for Life"[14].

Pillars of the EPT – Food for Life



In selecting certain priorities they underline especially the "what" and "where" aspects of future technological competition, by letting to some extent the "how" on the backstage.

[14] See "European Technology Platform on Food for Life - The vision for 2020 and beyond", http://etp.ciaa.be.

1. **Food Quality and Manufacturing** and **Food Safety** are at the top of the firms' priority. They express the central concerns with aspects that are vital to the relationship to the consumer and the credibility of the industry. Unsafe and poor quality food is the last thing a company can allow.
2. It is hence interesting to see what people within the company think about the general meaning of technology and technological improvements. According to them: "These are the means we need in order to reach substantial certainty about the reliability of food. Food crises are the most important danger for the food sector."
3. The relation between **food and the consumer** is considered also as a critical issue, although it is difficult to define. It may express a preference for new methods for assessing consumer preferences but also the importance of consumer science to the decisions of the companies.
4. **Health** is a crucial issue for the sector. Nonetheless its meaning must be relate to an important dynamics, that of **novel and health oriented food** which is **a minor fraction** of the total food production yet, but has a major role in defining new technological paths. Hence the issue is absolutely important for innovation but it does not touch many food companies.
5. The other themes are related to the above mentioned priorities. **Sustainable food production** and **Communication Training and Technology Transfer** show a relatively high importance. They are linked to actions for supporting to the core subjects of future food research. The first one is more technically oriented while the second one has to do with organisational structure and policies for sustaining innovation.
6. **Food chain management** is highly important for about half of the respondents, with fairly large differences according to specific **sectors**, as the following tables will show.
7. In terms of relative importance the distribution of the opinions against the **size factor** (always in term of turnover) indicates that food quality and manufacturing and food safety are objectives for all companies, irrespective of size.

Pillars of ETP by firm size

	Total	0-9 empl.	10-19	20-49	50-249	250-499	500-999	1000-9999	>10000
Food and health	65%	59%	57%	54%	64%	73%	78%	83%	85%
Food quality and manufacturing	75%	81%	64%	55%	79%	81%	95%	85%	85%
Food and consumer	62%	66%	47%	53%	60%	77%	71%	63%	100%
Food safety	73%	65%	65%	68%	76%	73%	82%	62%	100%
Sustainable food production	46%	47%	52%	58%	45%	35%	56%	29%	33%
Food chain management	46%	34%	36%	48%	43%	56%	64%	39%	65%
Communication, training and t.t.	47%	35%	45%	55%	42%	47%	54%	47%	64%

Pillars of ETP by sector

	Total	Meat and meat products	Fish and fish products	Fruits and vegetables	Oils and fats	Dairy products	Cereals	Animal feed	Other foods
Food and health	64,2%	66,7%	51,7%	50,4%	78,7%	76,1%	72,8%	55,6%	58,7%
Food quality and manufacturing	74,7%	75,5%	77,1%	67,6%	81,4%	77,4%	85,3%	66,9%	71,5%
Food and consumer	61,5%	54,4%	53,0%	71,9%	62,7%	58,2%	69,7%	62,0%	63,2%
Food safety	73,6%	82,9%	75,6%	68,9%	94,8%	67,6%	65,7%	77,4%	71,7%
Sustainable food production	45,6%	37,1%	40,4%	68,0%	61,0%	45,1%	40,7%	51,0%	45,7%
Food chain management	45,8%	53,4%	55,2%	52,5%	70,3%	39,3%	40,1%	53,1%	36,5%
Communication, training and technology transfer	47,0%	59,2%	22,0%	43,3%	48,4%	43,1%	32,1%	45,4%	52,0%

2.3. Context 3: Sources to innovation: bottlenecks, barriers, and opportunities for technology transfer

A primary aspect that has significant influence on the innovation patterns of companies is **the way firms get support and hints for developing innovative programs**.

In this part of the Vision Paper the importance of different sources for innovation and the relative impact in terms of bottlenecks and barriers are discussed.

The logic of this section organises the material in terms of evaluations expressed by companies about favourable versus non favourable factors which may have an influence in steering the innovative activities of the companies: methods of direct and indirect support, options for developing Technology Transfer activities.

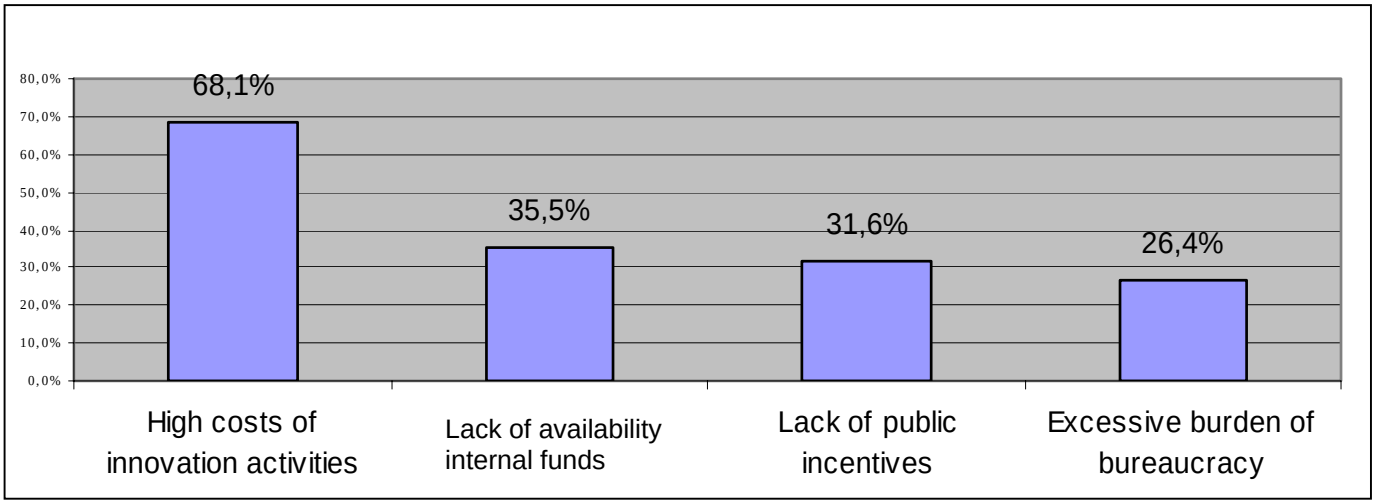
THESIS 7: "BEST PRACTICES GUIDES", "TRAINING" AND FREQUENT "SEMINARS & CONFERENCES" ACTIVITIES ARE PERCEIVED AS THE MOST URGENT SUPPORT ACTIONS FOR TECHNOLOGY TRANSFER. FINANCIAL SHORTAGE IS THE MAIN FACTOR THAT INHIBITS INTERNAL R&D IN SMES. BUREAUCRATIC BARRIERS ARE JUDGED STILL TO BE TOO HIGH.

1. Companies have a clear view about the fact that Technology Transfer activities necessarily complement internal R&D activities. The industry has an inclination, especially in its large SMEs segment to rely upon Technology Transfer as a major tool for fostering innovation; this must in turn be based upon different national strategies, many already in force, that has a major role in conditioning the reply of the companies.
2. There is a clear preference for certain actions of Technology Transfer. Companies favour those forms of sourcing the information for R&D that are in line with the need of a ready to use technological advice, not requiring additional time and long R&D investment. Hence "**best practice guides"** and "**seminars and conferences"** are judged to be the most useful vehicles of information for selecting programmes of Technology Transfer.
3. **Training *is*** considered as a major channel of rapid deployment of technical information implying direct involvement of all workforce

employed at scientific and technical level. Also **on site trials** are favoured by a significant group of the respondents. The same is applicable to the **technical brochures with short descriptions of technologies**. All these major issues are consistent through the different size of the companies, although training tends to become more and more important with the increase of the firm size.

4. As for **Obstacles** related to the propensity of innovation, companies seems to have clear cut opinions as to those recurring factors that are a barrier to a more intense or frequent innovation. The dominating obstacles are linked both to the **high costs of innovation activities** and to the **lack of availability internal financial funds**.

Obstacles against innovation behaviour



The objective (costs) and subjective (internal availability of funds) factors, reinforce each other making innovation a narrow choice for the majority of firms. **Lack of public incentives** is also identified as a delaying component, particularly with SMEs.

5. The other "absence" factors are almost as important as the above mentioned aspects, in the opinion of companies: lack of **opportunities for innovation**, lack of **new ideas**, lack of specific **technical knowledge** are sometimes additional causes interposing in the desire of companies to innovate. A major distinction concerns

the availability in house of **qualified personnel**: it might make the difference.

6. It is interesting to note that **Regulatory issues ("Too restrictive regulations and laws"**), is perceived by some respondents as an important barrier (mostly for bigger firms but also for small ones).
7. But, as a rule, firms know that they need to innovate and very often would be ready to initiate coherent internal R&D aimed at specific problem solving. Money or availability of money at the right time are he true barriers to a continual and more intense innovative routine.
8. Of course all these aspects are correlated with size and market position of the respondents. Financial obstacles tend to be much more stringent in the SMEs family of the industry and less critical at greater company size.
9. Finally, it must be recognised that all companies, with minor distinctions, consider that innovation is too much constrained by the continual presence of **an excessive burden of bureaucracy**. Duties linked to the preparation of applications for public funding are perceived as too costly, at least in terms of time and credibility of the procedures.

These observations prove in a quite direct way that the companies face more or less the same category of difficulties regarding innovative paths. Willingness to innovation is clearly spread among all type of respondents, but the basic concern is the availability of funds.

THESIS 8: USEFUL INFORMATION FOR INNOVATION MAINLY DERIVES FROM MARKET RELATIONS (CLIENTS, SUPPLIERS, EQUIPMENT PROVIDERS). TECHNOLOGY TRANSFER BODIES, TRADE ASSOCIATIONS AND TECHNICAL LITERATURE FOLLOW SUIT. FOR A MAJORITY OF FIRMS, INNOVATION HINGES UPON INTERNAL R&D.

This thesis touches upon a critical and fundamental issue concerning internal R&D activities of the food industry. By allotting different sources of innovation into different categories it is possible to understand better which are the specific patterns of innovation preferred by the industry. By giving different priorities to different sources of innovation activities it is consequently possible to achieve an understanding of the kind of

innovation that companies find coherent with their R&D plans for being more competitive in the market.

If we look at the responses in terms of different categories relating to different methods of technology transfer it can be noted that:

- ⇒ Technology transfer anchored to a dynamics of **relational innovation** is by far the **more common and appropriate** methodology of sourcing ideas and stimuli for innovation. The "relational" label characterises the dominant role of "peer based information", i.e. the information conveyed through the continuous exchange of opinions and judgements on the relevant issues concerning the innovation of the firm. Many companies favour the learning environment in which the workforce acquire basic information in the context of a frequent contact with clients, equipment providers and other subjects that may exercise a role of "soft persuasion" towards technical staff and decision makers on the issues concerning innovation;
- ⇒ What could be called **Traditional sources of innovation** are the ones that better suit the programmes of firms with clear objectives about the type of innovation they need. Traditional instruments account for the fundamental role of **internal research**, the accompanying role of the **Academia**, the equally important function of the knowledge, based upon the of available literature, both **Scientific** and **Technical**. This model of technology transfer is still very important for a significant group of firms but is not the regularly used methods for the majority of the companies.
- ⇒ A less preferred, but sometimes very efficient method of enhancing the awareness of innovation information is if the technology transfer passes through **bridging institutions**: **Technology transfer agencies**, **Research Institutes** and **Trade associations**. There is therefore room for innovation mediated by centres of competence whose role might be the stimulator, but also of the problem solver, at least for a basic level of problem solving.
- ⇒ **Networking and new media-based** Technology transfer is still a method that needs to be tested and evaluated by firms.

There is some scepticism about the real usefulness of non-accredited **consultants**, while **centres of excellence** and the **Internet**, are also potentially important sources for delivering innovation, however these methods still need to achieve more attention of the companies[15].

These results illustrate a relatively stable opinion of companies throughout Europe. All underline the fact that innovation at company level requires a friendly environment and a good "toolbox" in order to achieve an increase of interest from the industry. There is however a clear preference for those methods of technology training that are related to potentially "quick wins" and "immediately implementable actions", i.e. those products of a continuous and incremental attention to innovation having a relative low cost but also an important impact into the company, preparing so the internal environment for next steps characterised by a more sustained engagement towards innovation on behalf of the companies and its workers.

An efficient and balanced innovation policy, both at national and European Union level, requires an appreciation of the needs, and also of preferences of the companies forming the industry. It is therefore useful to discuss the opinions that the interviewed companies have expressed in connection with two critical items: the form and the level of **financial support to innovation** and the **preferred policy measures** especially the ones touching aspects of firm and environment organisation.

2.4. Context 4: The judgement on current policies

The current innovation policies are still largely inadequate to give a decisive spin to innovation in the industry. A much larger role of the continental level of decision-making is strongly needed, in a new articulation with national and branch priorities.

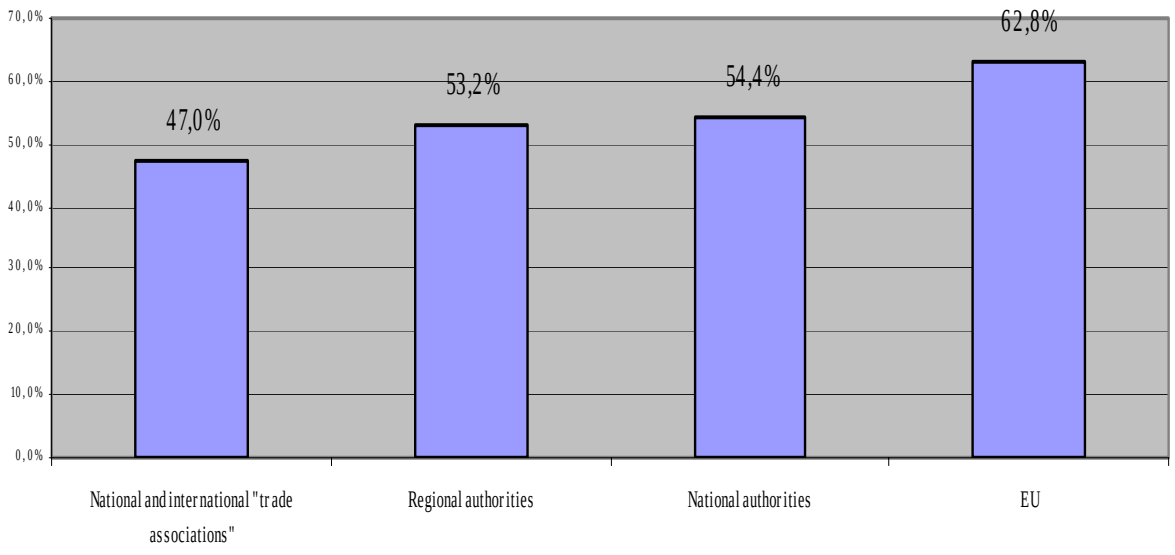
[15] In quantitative terms, the corrisponding question in the survey gives the following ranking to specific sources of information: Internal R&D (60% of firms rates its importance "very high"), Clients (44%), Suppliers (43%), Equipment providers (38%), Technology transfer (31%), Trade associations (30%), Technical literature (27%), Competitors (27%), Internet (26%), Research institutes (24%), Scientific literature (22%), Centres of excellence (20%), Universities (19%), Consultants (17%).

The new wave of European and National Technological Platform is an excellent response to the present state-of-art.

THESIS 9: FOOD AND DRINK COMPANIES HAVE A SOBER AND REALISTIC ATTITUDE TOWARDS INITIATIVES OF SUPPORT FOR THE FOOD INDUSTRY. OPINIONS ABOUT FUTURE FINANCING EMPHASIZE THE PREFERENCE FOR THE EU AS A FUNDING PARTNER. PREFERRED POLICY MEASURES ARE THOSE THAT EXPLOIT MORE OPPORTUNITIES FOR SELECTIVE SPENDING. BIG FIRMS ARE IN FAVOUR OF FISCAL INCENTIVES, SMES LOOK FOR MORE DIRECT SUPPORT.

1. Confidence toward the **co-financing role of the European Union** is widespread. Companies generally desire that their own internal R&D be coupled with European money. This attitude tends to be more stable with larger companies.
2. The European Union is considered a major partner for firms; national partners (both for finance and organisation) come second.

Preferred partner



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3. SMEs are in favour of direct and 100% **financial support**.

Chosen opportunities: totally funded programme and Fiscal Initiative – By firm size

Firm size	Interest in participating in RTD activities totally funded by EU	Fiscal incentives to R&D as one of the preferred policy measures
0-9 employees	50%	25%
10-19 employees	55%	35%
20-49 employees	44%	51%
50-249 employees	47%	49%
250-499 employees	56%	61%
500-999 employees	37%	46%
1000-9999 employee	55%	59%
>10000 employees	41%	76%

However, **greater and easier EU funding opportunities for SMEs** is considered as a general objective of EU policy making. This means that the role of the European Union is perceived as an intelligent, objective regulator rather than that of mere money transfer agency.

3. RECOMMENDATIONS FOR FUTURE POLICIES

In this final section of the Vision Paper, collected information, evidence and arguments that have been put forward to reconstruct the dynamics of the Food and Drink industry in connection with innovation processes, will be streamlined to formulate a well based and shared opinion about what can be usefully done to cope better with the future competition.

This final chapter is organised to emphasize the important priorities of political intervention to help of the sector, with particular reference to SMEs. In particular the impact of current traditional policies of innovation will be assessed. **It can be concluded that the Food & Drink industry needs a substantially different approach to secure the ambitious objectives that an innovation policy is supposed to achieve**.

The opinion will then be tested and discussed in the light of several different factors that are judged to be relevant to the policy measures that are ranked and invoked. These factors emerge as particularly sensitive for shaping the effective response of companies to potential policy measures. This means that they have been selected as major determinants of firm behaviour.

These factors will be mostly linked to two obvious but nonetheless central dimension: **sector** and **geography**.

The first one bears a relevant explanatory power, namely the one which is most correlated with variations in the food manufacturing chain. Technologies vary also with the belonging of a company to a certain production system rather than another.

The influence of the geography is related to the differences in maturity of the different national markets that are still a fundamental dimension in the evolution of the awareness of companies with respect to the theme of innovation. For instance, the role of retailing does not have the same impact on the technology and quality policy of SMEs in all markets.

Important as they are, however, these two relevant dimensions will not be included in this Vision Paper, as they are presented in the Survey results national focuses.

Finally some reflections will be devoted to some issues whose role in the determination of future programmes of support to the industry is judged to be pivotal. These issues are about the general significance of technology for the food sector and about two main sources of interest/concern in sense that looks also at societal worries: food and health and food quality.

3.1. A new wave of innovation policies for the Food and Drink industry

The distribution of the companies that constitutes the Food and Drink sector is such that the theme of innovation is unevenly perceived by companies themselves. The industry reflects a composition that polarises the differences, both qualitative and quantitative, among the component enterprises.

- ⇒ There is a **large population of SMEs, fragmented and unevenly distributed among branches and countries** in a way that results frequently in a **dispersion** that is difficult to cope with;
- ⇒ There is a relatively **low number of highly integrated large companies**. Some multinationals among them, operating both in **quality mass market** and niche product with a highly concentrated oligopolistic logic and clear ideas about the expected evolution of the industry.

To achieve a more innovative, effective and wide industry, one of the tasks of policy makers having responsibility for the future of food production is therefore to achieve a sounder interpretation of the specific problems and dynamics of SMEs. The first step in this direction is to explore within the large population of SMEs in more details.

This is an area where the work carried out in the SMES-NET project can provide a significant contribution to a better understanding and clear view.

In particular, it was established that the term SME is too general for formulating an efficient food policy for minor enterprises. Studies of the sector tend to connect the size of SMEs with implicitly weak and often inconsistent dynamics. They see it as the vast territory of many and unspecific firms with small, marginal innovation, induced by their bigger counterparts in the food chain. This way of looking at the problem describes a system of relations where small and unqualified companies are

compelled to behave like they behave. If they do not have financial and cultural resources to cope with a changing market, they will go out of business in the medium term.

There are four important distinctions to be drawn:

- ⇒ **Medium-sized companies must be treated as a group with its own logic and specific characteristics**. More frequently than the average they are very good manufacturers with a history of continuous innovation and a great attention to product development. This part of the industry is often the place where big and also radical innovations are made. Medium size firms are typically the most promising group of innovation based food companies;
- ⇒ **Small companies are not necessarily low quality companies**. To some extent they defend the continuity of local food markets. They maintain competencies and skills about traditional products. This function is not to be despised, but must be improved and made compatible with modern manufacturing practices, i.e. practices that involve a certain degree of innovation;
- ⇒ Small companies have an interest in **raising their standards and therefore they need a wider access to innovation**. They must be helped to make this step. This is a difficult task. But the fact that it is difficult must not impede the search for alternative strategies and policies advice to the this objective;
- ⇒ There is a substantial "continuum" between the group (and the culture) of **top quality small companies** and the group of **innovative medium sized companies**. The logic is one of **"proximity".** This aspect is important, because it might be exploited for creating initiatives for collective research and associations of interest within a branch and/or in a geographical area to serve the whole industry.
- ⇒ Last but not the least, although generally present in the strategic choices of large companies, innovation is typically not treated as a priority (big companies build up their success on large markets and standard easily to recognizable products with relative small technical improvements).

These observations lead to a fairly drastic conclusion: **the usual interpretation of the innovation of the food sector compared to other**

sectors is biased by considerations that are mostly valid for other sectors only. This results in a poor acknowledgement of the innovation potential and activities of food & drink industry. This is an unjust conclusion that has important negative effects on policy actions.

The survey and the regional activities carried out in the context of the SMES-NET project proves that SMEs, and the food industry in general, presents a **low degree of sensitivity to current and standards of policy making carried out in the name of increased levels of innovation**. The food and drink industry, in other words, is a target for which common innovation policies based on the relation: "**more investments in R&D = more innovation output"** is badly conceived.

What constitutes a mainstream policy vision for concentrated and oligopolistic sectors has a loose and very unspecific validity for food and beverages.

The role of incremental innovation is important (and, given the nature of the production, is a "progressive" role), and it must be preserved; radical innovation must also be encouraged. But the relation between the two must also be established along alternative policy measures. In particular the positive influence of SMEs must be safeguarded that are vehicle of innovation in traditional productions. This can be better assured by small company size. It must also be emphasized when really innovative firms are selected that small size and propensity to innovation are more and more frequently associated. The incremental innovation carried out largely by SMEs can be particularly in line with what food consumers prefer and easier accept, since large breakthrough may generate consumer resistance.

This considerations, and more broadly the discussions arisen throughout the SMEs-NET project, can lead to a mindset that can be summarized in the following, final, thesis n°10.

THESIS 10: A PROMISING POLICY OF ENHANCING AND SUPPORTING INNOVATION IN THE FOOD AND DRINK SECTOR SHOULD BE BASED ON A MIX OF ACTIONS INSPIRED BY THE PRINCIPLES OF "SOFT" AND "TARGETED" POLICY MAKING. THIS INCLUDES: SOPHISTICATED TECHNOLOGY TRANSFER, COMPETENCE CENTERS AND NETWORKING PROGRAMMES.

These principles describe a vision that differs in many respects from the mainstream of innovation policy and technology transfer mentioned before.

What is most critical is the fact that the ordinary policy measures tend to conflate strategies which are appropriate for standard innovation-based sector and branches (e.g. IT, Aeronautics, Chemistry, Pharmaceutical industry). The same strategies when applied to food, reveal limits and problems that create frustration within the sector itself.

There is a bad academic diffused tendency to consider the food system as an archaic system by definition. The same tendency is inherited by policy makers, to the effect that food and drink companies think of themselves to be outside the mainstream of innovation This is not generous, and what counts more, useless to stimulate a reaction in the system itself.

The opposing attitude is rather one that sees the reasons for the undeniable delays of development of the industry but that, at the same time looks at the margins of improvements that the peculiar structure of the sector allows. This means to be able to devise a strategy permitting the building up of actions and programmes that enter in a productive relationship with he different environments and priorities of the Food and Drink sector in Europe. For this reason Technology transfer, if performed with new methods in accord with genuine needs of the firms, is the key action to recover the F&D sector from its relative low engagement into innovation.